

## NEW FACTS CONCERNING CEPHALOSPORIUM WILT OF ELMS

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ONE RESULT of the experience of having to wage a campaign against the Dutch elm disease in America has been the calling of attention to the native wilt diseases of elms. Of these there are two; one is tentatively designated "Cephalosporium wilt" (or "Cephalosporium die-back"), the other "Verticillium wilt." They are widely spread and the first named is relatively frequent in nursery stock and on older trees of all ages. Both are being studied intensively at the Arnold Arboretum of Harvard University with the object of more clearly defining symptoms, discovering means of spread, determining the course of the infection and testing methods of control. My own investigations on the former are now sufficiently advanced to warrant the publication of certain findings which appear to point the way to control.

1. Two kinds of reproductive bodies, as recently noted by Dr. Curtis May, are produced by the fungus that causes Cephalosporium wilt. These are (a) naked spore heads such as are characteristic for the genus *Cephalosporium* and (b) pycnidia, a type of fructification not known for that genus. Both make their appearance in laboratory cultures and both occur in nature. The pycnidia are of special importance but no explicit statement of their occurrence in nature could be found in the literature. The significant feature to be emphasized, one hitherto unrecorded, is their natural abundance and their importance. They form profusely in the bark of infected twigs and branches as the bark tissues gradually die during the summer. These pycnidia contain myriads of small spores which remain viable over winter. The spores ooze out in a gelatinous matrix through ostioles to the surface of the bark. Apparently wind and rain play an important part in spore dissemination. Also, since spores are exposed to the outside, such agencies as insects and birds may serve an important rôle in transmission of the pathogene.

2. Wounds in the leaves provide the most common infection court. Large numbers of leaves injured by canker worms have been found to be infected in the vicinity of killed branches on the same and nearby trees. Any insect causing open wounds in leaves or stems such as the canker worms (*Alsophila pometaria* Harr. and *Paleacrita vernata* Peck), the spiny elm caterpillar (*Hamadryas antiopa* Linn.), the elm leaf beetle

(*Gallerucella luteola* Müll.), the small European elm bark beetle (*Scolytus multistriatus* Marsh) and numerous others, provide suitable wounds through which the fungus may enter the suscept.

3. An early symptom of the typically infected leaf is a yellowing near the infection court or wound. The yellowed area increases and the portion near the wound dies and becomes brown. Usually a brownish discoloration of the veins occurs in advance of the necrotic area in the mesophyll. Finally the discoloration extends through the vascular strands of the petiole into the stem, and the leaf drops off. The pathogene has been isolated from a large number of such leaves and from the stem in the vicinity of the leaf base.

4. Artificial inoculations made on seedlings in the greenhouse substantiate these facts observed in the field. Whether mycelium, spores from spore-heads, or spores from pycnidia were used as inoculum no infection resulted when unwounded leaves were inoculated. On the other hand, any one of these kinds of inoculum brought about infection when leaves were wounded. In stained serial sections of artificially inoculated leaves, the pathogene has been traced from the leaf wound into the stem through the vascular strands of lateral veins, midrib and petiole. The fungus has also been recovered from various regions of wounded leaves and stems of inoculated seedlings by culture methods.

5. Based on the foregoing facts, a number of experiments on control of the disease have been initiated. The first important step is to prune out all dead and infected branches in order to eradicate the disease from individual cases and to destroy the source of future inoculum. Spray tests are also in progress in which insecticides and fungicides are being used to prevent attacks of insects and fungi and to reduce possibilities for infection through wounds already present. Results of these preliminary tests are encouraging; they indicate that a combined pruning and spraying program offers promising possibilities for controlling Cephalosporium wilt.

It is with pleasure that acknowledgment is made of the excellent facilities afforded for this investigation by the pathological laboratory at the Arnold Arboretum and the adjunct laboratory of the North Country Garden Club at the Pratt Estate Oval, Glen Cove, Long Island, New York.

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